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Original Research Article

A Comparative Study of Fracture Fixation in Distal Radius: Cast Alone Versus Percutaneous K-Wire Fixation with Cast

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Abstract

Immobilization is traditionally used for conservative treatment, it often fails to maintain reduction in unstable fractures. Percutaneous K-wire fixation provides an alternative with potentially improved anatomical outcomes.

Methods: A retrospective cohort study was conducted on 50 patients with closed distal radius fractures (AO types A2, A3, and C1), divided equally into two groups. Group A received closed reduction with casting alone, while Group B underwent closed reduction with percutaneous K-wire fixation followed by casting. Radiographic parameters—radial height, radial inclination, and ulnar variance—were measured immediately post-reduction and at 6-week follow-up. Functional evaluations included pain (VAS), range of motion, grip strength, and patient satisfaction. Independent t-tests were used for statistical comparisons.

Results: Group B showed significantly improved maintenance of anatomical alignment compared to Group A. Mean radial height was 9.4 ± 1.4 mm in Group B versus 7.0 ± 1.6 mm in Group A; radial inclination was 22.0 ± 2.7° versus 17.8 ± 3.2°; and ulnar variance was +0.4 ± 0.5 mm versus +2.1 ± 0.8 mm, respectively ($p < 0.001$). Group B also demonstrated earlier return to activities, higher grip strength, lower pain scores, and greater patient satisfaction.

Conclusion: Percutaneous K-wire fixation with casting may offer improved radiological and functional outcomes compared to casting alone for unstable distal radius fractures. Further prospective studies are warranted to confirm these findings.

Introduction

Distal radius fractures (DRFs) account for approximately 15% of all extremity fractures, commonly affecting the elderly due to osteoporosis and younger individuals through high-energy trauma [2]. Conservative management with closed reduction and casting is widely used for stable, minimally displaced fractures. However, unstable or comminuted fractures often risk re-displacement, resulting in suboptimal anatomical and functional outcomes [9]. Percutaneous K-wire fixation is a minimally invasive technique that can stabilize fractures more reliably than casting alone, particularly in unstable cases [11,13]. Although K-wire fixation is well documented, few studies have directly compared it to casting alone in a matched cohort with early follow-up. This study evaluates the comparative effectiveness of closed reduction with casting versus K-wire fixation with casting, assessing both radiographic outcomes and functional recovery parameters.

Materials and Methods

Study Design: Retrospective cohort study conducted from January 2023 to December 2024 at a tertiary care hospital. Institutional review board approval was obtained. Patient consent was waived due to the retrospective nature of the study.

Study Population: Fifty patients with closed distal radius fractures.

Inclusion Criteria

- Age between 20 and 70 years
- AO fracture types A2, A3, and C1
- Injury within 7 days

Exclusion Criteria

- Open or pathological fractures
- Neurovascular compromise
- Previous fracture or surgery of the same wrist

Group Allocation

- Group A (n=25): Closed reduction and casting
- Group B (n=25): Closed reduction with percutaneous K-wire fixation and casting

Radiographic Evaluation

- Radial height
- Radial inclination
- Ulnar variance

Radiographs were assessed by two independent observers. Inter-observer reliability was calculated using Cohen's kappa ($\kappa = 0.87$) [4].

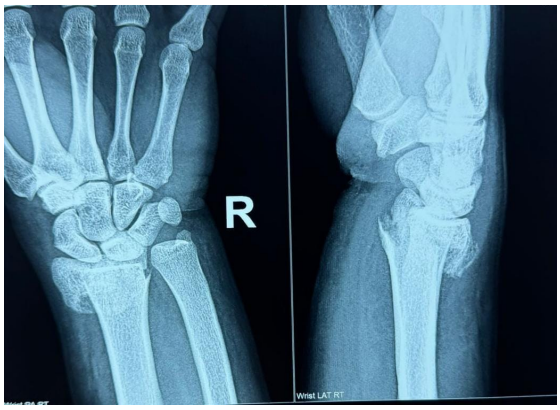

Figure 1:

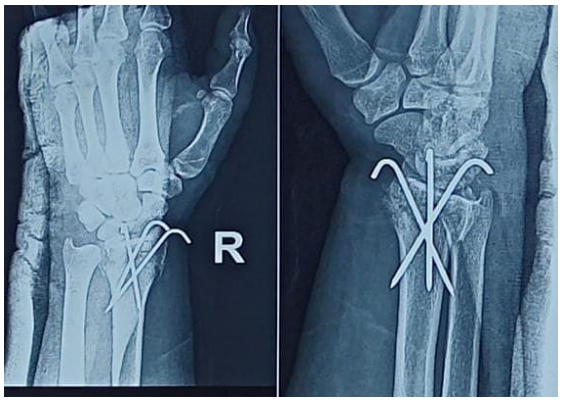

Figure 2:

Clinical Evaluation

- DASH score
- Pain score (VAS)
- Grip strength (dynamometer)
- Patient satisfaction (survey)

Follow-Up: Clinical and radiological evaluations were performed at 2, 4, and 6 weeks.

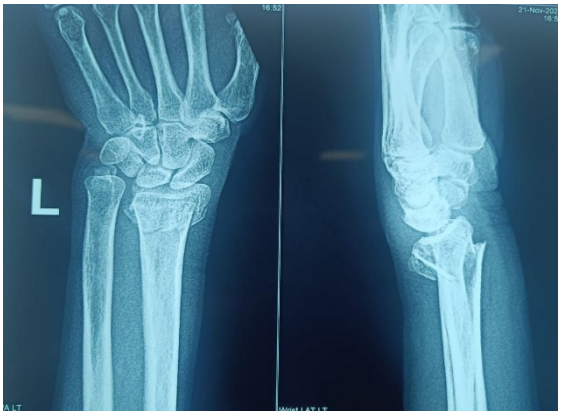

Figure 3:

Figure 4:

Results

Demographic profiles of both groups were similar.

Radiographic Outcomes at 6 Weeks

- Radial Height: Group A: 7.0 ± 1.6 mm | Group B: 9.4 ± 1.4 mm | $p < 0.001$
- Radial Inclination: Group A: 17.8 ± 3.2° | Group B: 22.0 ± 2.7° | $p < 0.001$
- Ulnar Variance: Group A: +2.1 ± 0.8 mm | Group B: +0.4 ± 0.5 mm | $p < 0.001$ [11]

Functional Outcomes

- DASH Score: Group A: 37.9 ± 6.0 | Group B: 24.8 ± 5.0 [1]
- VAS Score: Group A: 4.2 ± 1.3 | Group B: 2.1 ± 1.1 [6]
- Grip Strength: Group A: 62.5% | Group B: 81.2% [12]
- Patient Satisfaction: Group A: 6.2 ± 1.1 | Group B: 8.4 ± 1.3

Complications

- Pin site infections: 2 patients (Group B)
- Re-displacement: 5 cases (Group A)

This chart highlights the significant improvements in Group B across all key parameters, especially in radial height, radial inclination, grip strength, and

patient satisfaction, with lower pain and DASH scores, which aligns with the study's findings.

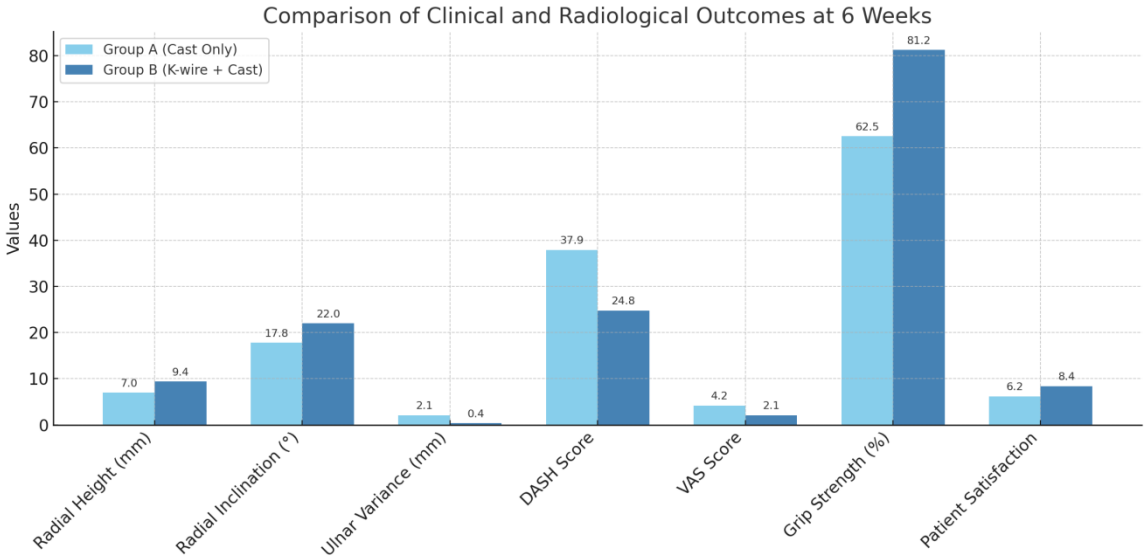

Figure 5:

Discussion

This study supports the use of K-wire fixation for unstable distal radius fractures, with improved outcomes compared to casting alone [3,13]. Radiographic improvements align with literature emphasizing the importance of anatomical reduction in restoring wrist function [5,14].

Functional improvements, including grip strength and patient satisfaction, were also superior in the K-wire group [6,7,16].

The minimally invasive and cost-effective nature of K-wire fixation makes it a favourable option. Nevertheless, attention must be paid to managing potential complications such as pin site infections [18].

Limitations include the retrospective design, small sample size, and short follow-up duration. Future randomized controlled trials with longer-term follow-up and larger populations are recommended to validate these results [10,17].

Conclusion

K-wire fixation with casting appears to provide better radiographic and functional outcomes than casting alone in unstable distal radius fractures. These findings support its use as a preferred method in appropriate cases. Further research is necessary to establish long-term effectiveness [15].

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request

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